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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/504,660

02/14/2000

William E. Hoke

07206-047001

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7590

02/05/2003

DALY, CROWLEY & MOFFORD, LLP
SUITE 101
275 TURNPIKE STREET
CANTON, MA 02021-2310

EXAMINER

KANG, DONGHEE

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 02/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/504,660

Applicant(s)

HOKE ET AL.

Examiner

Donghee Kang

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 December 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 18-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 27-30 is/are allowed.
- 6) ☒ Claim(s) 18,31,32 and 34 is/are rejected.
- 7) ☒ Claim(s) 19-26 and 33 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Acknowledgment

1. Applicant's Response to Paper No. 19 has been entered and made of Record (Paper No. 20). Claims 18-34 are pending in this application.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language;

3. Claims **18 & 31** are rejected under 35 U.S.C. 102(e) as being anticipated by Onda (US 6,194,747).

Regarding claim **18**, Onda teaches a transistor comprising (Fig. 1):

a semi-insulating indium phosphide (InP) substrate (101) having a lattice constant; channel layer of InGaAs (103) disposed over the substrate, the channel layer having a lattice constant different from the lattice constant of the substrate; a Schottky layer of InAlAs (106) disposed over the channel layer, the Schottky layer having a lattice constant different from the lattice constant of the substrate; a first cap layer (107) disposed over the Schottky layer; a contact layer (108) disposed over the first cap layer, the contact layer having a first recess therein, such first recess having a bottom surface terminating in a top surface of the first cap layer; a second recess having a sidewalls in

the first cap layer and the Schottky layer, such second recess having a bottom surface terminating in the Schottky layer; a source electrode (109b) in ohmic contact with the contact layer; a drain electrode (109c) in ohmic contact with the contact layer; a gate electrode (109a) in Schottky contact with the Schottky layer.

Onda does not expressly teach that the first cap layer is a resistive layer. However, the first cap layer (107) of Onda would meet the recited term "resistive layer" because it has precisely the same material (InAlAs) and performs the same functions as applicant's claimed "resistive layer".

Regarding claim **31**, Onda teaches a transistor, comprising (Fig.1):

a semi-insulating indium phosphide (InP) substrate (101); a channel layer (103) of GaInAs disposed over the substrate layer; a Schottky layer (106) of AlInAs disposed over the channel layer; a first cap layer (107) disposed over the Schottky layer; a contact layer (108) having a first recess, and the resistive layer and the Schottky layer having a second recess; a source electrode (109b) in ohmic contact with the contact layer; a drain electrode in ohmic contact with the contact layer; and a gate electrode in Schottky contact with the Schottky layer.

Onda does not expressly teach that the first cap layer is a resistive layer. However, the first cap layer (107) of Onda would meet the recited term "resistive layer" because it has precisely the same material (InAlAs) and performs the same functions as applicant's claimed "resistive layer".

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims **32-33** are rejected under 35 U.S.C. 103(a) as being unpatentable over Onda in view of Hur et al (Ultralinear Doubled Pulse doped AlInAs/GaAs/InP HEMTs", Electronic Lett., IEEE Stevenage, GB, Vol.32, No.16, August 1, 1996, pages 1516-1518).

Onda applies to claim 31 explained above.

Regarding claim **32**, Onda does not teach the transistor further comprising a first doped layer and second doped layer. However, Hur et al. in Fig.1 teach the transistor comprising a first Si pulsed doped layer and a second Si pulse layer. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the Si pulse doped layer of Hur into the Onda's device, since the Si pulse doping profiled have been optimized to yield the broad constant region of transconductance with respect to gate-to-source bias.

Regarding claim **34**, Onda as modified by Hur teaches the cap (resistive) layer comprising AlInAs and the contact layer comprising GaInAs. However, Onda does not expressly teach a composition of the cap (resistive) layer comprising approximately $\text{Al}_{0.48}\text{In}_{0.52}\text{As}$ and a composition of the contact layer comprising approximately $\text{Ga}_{0.47}\text{In}_{0.53}\text{As}$. Note that Onda teaches the composition of indium (In) in the AlInAs/GaInAs material was set as $\text{Al}_{0.48}\text{In}_{0.52}\text{As}/\text{Ga}_{0.47}\text{In}_{0.53}\text{As}$ to provide a lattice matched to

an InP substrate (Col.1, lines 44-46). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form a cap and contact layer having the composition of indium (In) as set $\text{Al}_{0.48}\text{In}_{0.52}\text{As}$ / $\text{Ga}_{0.47}\text{In}_{0.53}\text{As}$ in order to provide a lattice matched to an InP substrate.

Allowable Subject Matter

6. Claims **19-26 & 33** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. Claims **27-30** are allowed.

The following is an examiner's statement of reasons for allowance:

~~Prior art reference, taken along or in combination, do not teach or render obvious~~
that the lattice constants of the channel layer and lattice constant of the Schottky layer is different from the lattice constant of the substrate and a difference between conduction band levels of the channel and Schottky layers is larger than when the channel and Schottky layers has the same lattice constant as the substrate.

Prior art reference, taken along or in combination, do not teach or render obvious that a ratio of silicon doping concentration approximately 2.5 to 1.5 between the first doped layer and the second doped layer.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

8. Applicant's request for reconsideration of the rejection for claims 19- 30 of the last Office action is persuasive and, therefore, the rejection for claims 20 & 27 of that action is withdrawn. However, claims 18 & 31-34 remain rejected as set forth in the last office action because applicant does not submit an argument for these rejected claims and the cited prior art teaches the claimed structure as claimed in claims 18 & 31-34.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

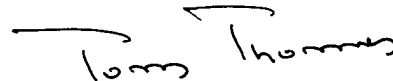
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donghee Kang whose telephone number is 703-305-9147. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

dhk
February 1, 2003

A handwritten signature in black ink that reads "Tom Thomas". The signature is written in a cursive style with a horizontal line above the first name.

TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800